**Lesson Summary**
Students graph and analyze raw data for concentrations of four different greenhouse gases in our atmosphere

**Prior Knowledge & Skills**
- Graphing skills
- Knowledge of the greenhouse effect

**AAAS Science Benchmarks**
*The Nature of Mathematics*
*Mathematics, Science, and Technology*

*The Physical Setting*
*The Earth*

*The Mathematical World*
*Symbolic Relationships*

*Common Themes*
*Constancy and Change*

**NSES Science Standards**
*Science in Personal and Social Perspectives*
*Natural and Human Induced Hazards*

*Unifying Concepts and Processes*
*Change, Constancy, and Measurement*

*Physical Science*
*Chemical Reactions*

**Teaching Time:** ~ 1 hour

**Materials**
- Graph paper
- Pen/pencil or graphing program on a computer

**Advanced Planning**
**Preparation Time:** ~10 minutes
1. Review the instructions
2. Gather the necessary supplies.

**Recommended Reading:** (attached)

Institute for Global Environmental Strategies: Discover Earth Program Materials
http://www.strategies.org/index.aspx
Activity 8: Greenhouse Gases

Objective: To graph and analyze raw data for concentrations of four greenhouse gases in our atmosphere.

Materials:
- graph paper
- pen/pencil
- or graphing program on a computer

Procedure:
1. Plot the data set for each of the greenhouse gases as a function of time versus concentration. Time should be on the horizontal (x) axis. Concentration should be on the vertical (y) axis.
2. Answer the conclusion questions.

Conclusion Questions:
1. In what year did the CFC's reach their maximum concentration? Why do you think that it occurred in this year?
2. What is the difference in parts per billion by volume (ppbv) between the concentrations of nitrous oxide in the years 1960-1970? For 1980-1990?
3. What is the slope of the line of carbon dioxide concentrations? What does this slope represent?
4. What is the difference in concentrations of methane between 1850-1990?
5. Explain the importance of ozone in our atmosphere.
6. What types of chemicals destroy the ozone layer?
7. What is the greenhouse effect? How does it work?
8. Where are the two largest holes located in the ozone layer? What negative effects will this have on Earth's organisms, present day sea level, and weather patterns?
9. What, in your opinion, do you think will happen to the j factor in the improved energy balance equation? What ultimate effect will this have on the energy balance of the Earth?
### Carbon Dioxide Concentrations

Mauna Loa, Hawaii

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### Chlorofluorocarbon (CFC) Production

in kilotons per year

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### Nitrogen Gas Concentration

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